Bear Valley Creek Spring Chinook Salmon Population

The Bear Valley Spring Chinook population (Figure 1) is part of the Snake River Spring/Summer Chinook ESU which has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde / Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run chinook. The Bear Valley population is a spring run and is one of nine extant populations in the Middle Fork Salmon River MPG.

The ICTRT classified the Bear Valley Creek population as an "intermediate" population (Table 1) based on historical habitat potential (ICTRT 2005). A chinook population classified as basic has a mean minimum abundance threshold criteria of 750 naturally produced spawners with a sufficient intrinsic productivity to achieve a 5% or less risk of extinction over a 100-year timeframe.
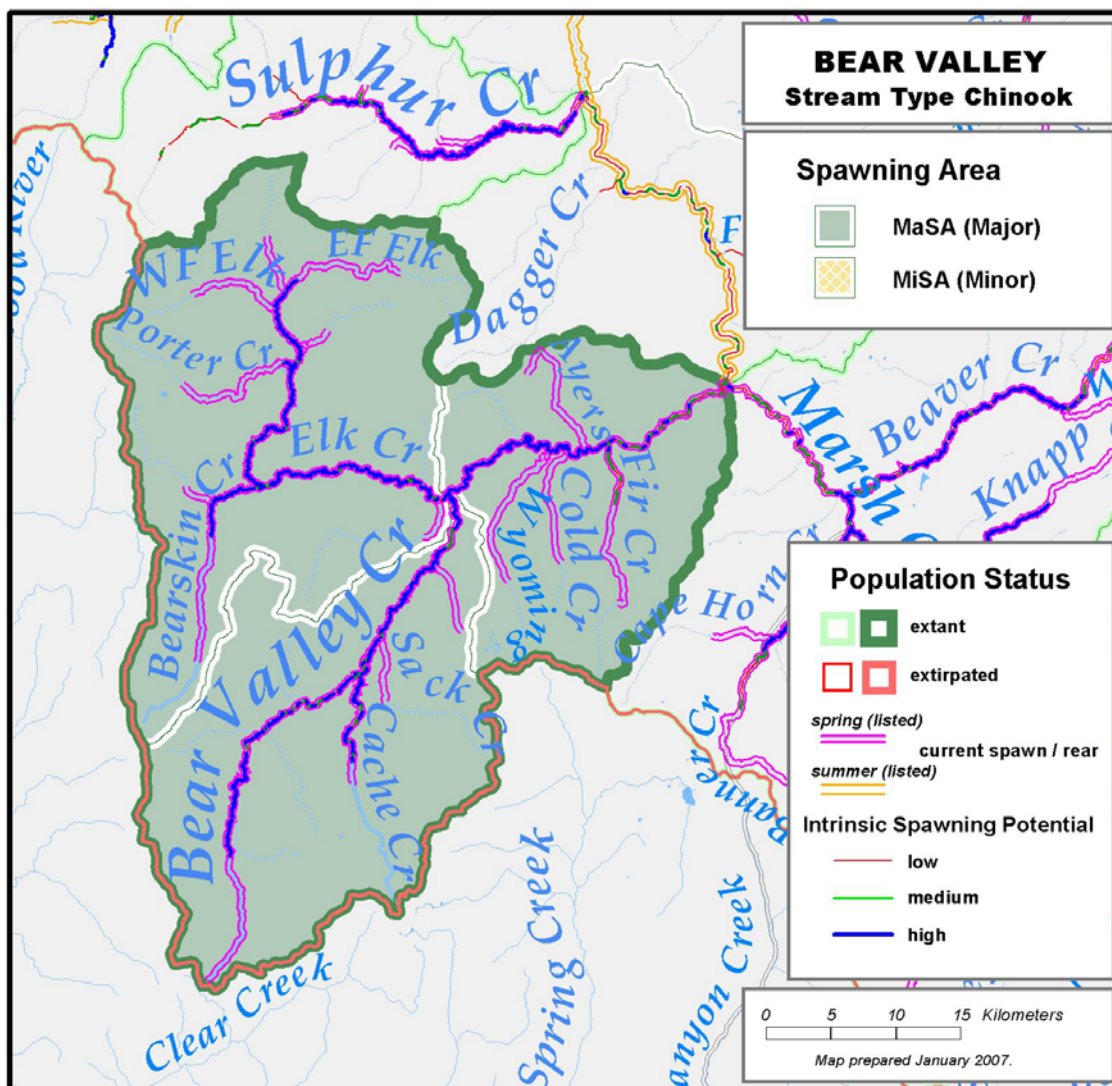

Figure 1. Bear Valley Creek Spring Chinook Salmon population boundary and major (MaSA) and minor (MiSA) spawning areas.

Table 1. Bear Valley Creek Spring Chinook Salmon population basin statistics and intrinsic potential analysis summary.

Drainage Area (km2)	496
Stream lengths km (total)[a]	205
Stream lengths km (below natural barriers)[a]	204
Branched stream area weighted by intrinsic potential (km2)	0.477
Branched stream area km2 (weighted and temp. limited)[b]	0.477
Total stream area weighted by intrinsic potential (km2)	0.489
Total stream area weighted by intrinsic potential (km2) temp limited[b]	0.489
Size / Complexity category	Intermediate / C (trellis pattern)
Number of Major Spawning Areas	3
Number of Minor Spawning Areas	0

[a]All stream segments greater than or equal to 3.8m bankfull width were included

[b]Temperature limited areas were assessed by subtracting area where the mean weekly modeled water temperature was greater than 22°C.

Current Abundance and Productivity

Current (1960 to 2003) abundance (number of adult spawning in natural production areas) has ranged from fewer than 16 in 1995 to 1,853 in 1962 (Figure 2). Abundance estimates are based on expanded redd counts (reference). Insert expansion methodology here

Recent year natural spawners include returns originating from naturally spawning parents, and no hatchery strays have been observed in the system. Spawners originating from naturally spawning parents comprise an average of 100% (Table 2).

Abundance in recent years has been highly variable, the most recent 10-year geomean number of natural origin spawners was 188 (Table 2). During the period 1979-1998, returns per spawner for steelhead in Bear Valley Creek ranged from 0.13 (1990) to 6.92 (1996). The most recent 20 year (1979-1998) SAR adjusted and delimited geometric mean of returns per spawner was 1.47 (Table 2).
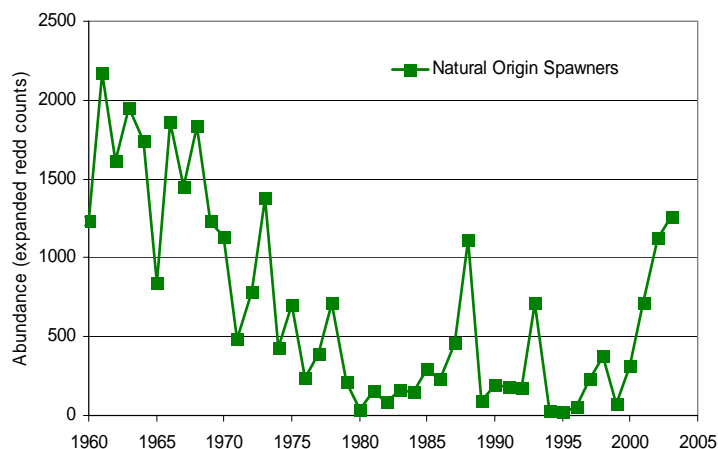

Figure 2. Bear Valley Creek Spring Chinook Salmon population spawner abundance estimates (1960-2003).

Table 2. Bear Valley Creek Spring Chinook Salmon population abundance and productivity estimates.

10-year geomean natural abundance	188
20-year return/spawner productivity	1.36
20-year return/spawner productivity, SAR adj. and delimited[a]	1.47
20-year Bev-Holt fit productivity, SAR adjusted	3.03
20-year Lambda productivity estimate	1.10
Average proportion natural origin spawners (recent 10 years)	100%
Reproductive success adj. for hatchery origin spawners	n/a

[a]Delimited productivity excludes any spawner/return pair where the spawner number exceeds 75% of the size threshold for this population. This approach attempts to remove density dependence effects that may influence the productivity estimate.

Comparison to the Viability Curve

- Abundance: 10-yr geomean natural origin spawners
- Productivity: 20-yr geomean R/S (adjusted for marine survival and delimited at 563 spawners)
- Curve: Hockey-Stick curve
- Conclusion: The Bear Valley Creek Spring Chinook salmon population is at **HIGH** risk based on current abundance and productivity. The point estimate resides below the 25% risk curve (Figure 3).
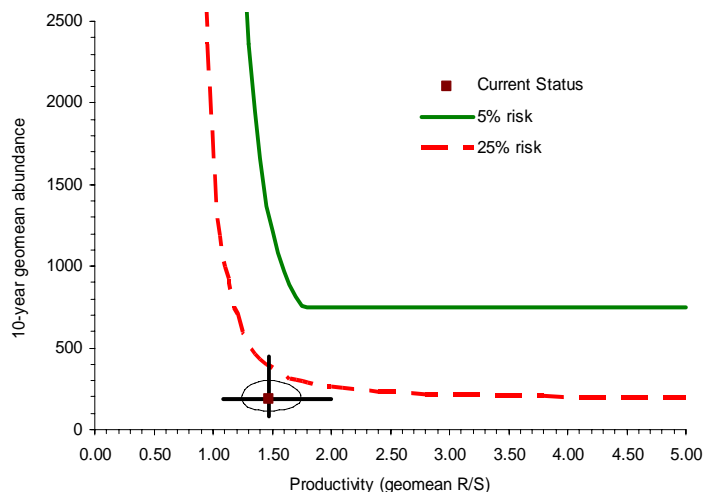

Figure 3. Bear Valley Creek Spring Chinook current estimate of abundance and productivity compared to the viability curve for this ESU. The point estimate includes a 1 SE ellipse and 95% CI (1.81 X SE abundance line, and 1.81 X SE productivity line).

Spatial Structure and Diversity

The ICTRT has identified three major spawning areas (MaSA) and no minor spawning areas (MiSAs) within the Bear Valley Creek Spring Chinook population. The MaSA has no modeled temperature limitations. Spawning is widely distributed across the population. Spawning in Elk Creek primarily occurs from the West Fork Elk Creek downstream to the confluence with Bear Valley Creek. In Bear Valley Creek most spawning occurs upstream of Fir Creek, extending
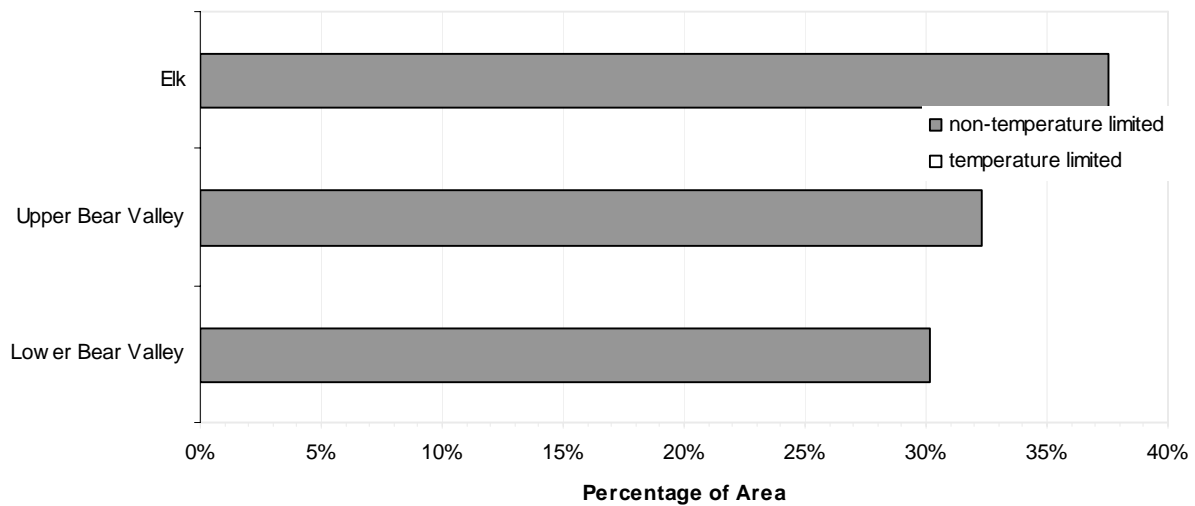

Figure 4. Bear Valley Creek Spring Chinook salmon population distribution of intrinsic potential habitat across major and minor spawning areas.

Factors and Metrics

A.1.a. Number and spatial arrangement of spawning areas.

The Middle Fork Salmon Bear Valley Creek population of spring Chinook has three MaSAs (Lower Bear Valley, Upper Bear Valley and Elk); the entire intrinsic potential habitat is located within the MaSAs. The total branched stream area weighted by intrinsic potential is 477,452 m2, equivalent to 4.7 MaSAs. This metric is rated *Very Low Risk* because there are 3 MaSAs in a non-linear (trellis) pattern and because of the large amount of total branched stream area.

A.l.b. Spatial extent or range of population.

The IDFG has conducted annual spawner index counts since 1957 on Bear Valley and Elk creeks. Index areas are present in all MaSAs and cover Bear Valley Creek from Fir Creek upstream to near the headwaters and Elk Creek from its mouth upstream to West Fork Elk Creek. Since 1995 researchers from the USFS-Rocky Mountain Research Station have been surveying all potential spawning habitat in the basin. This metric is rated *Very Low Risk* because current spawning distribution mirrors historical and the historical range has not been reduced. All MaSAs are occupied at both the lower and upper ends based on recent spawner surveys.
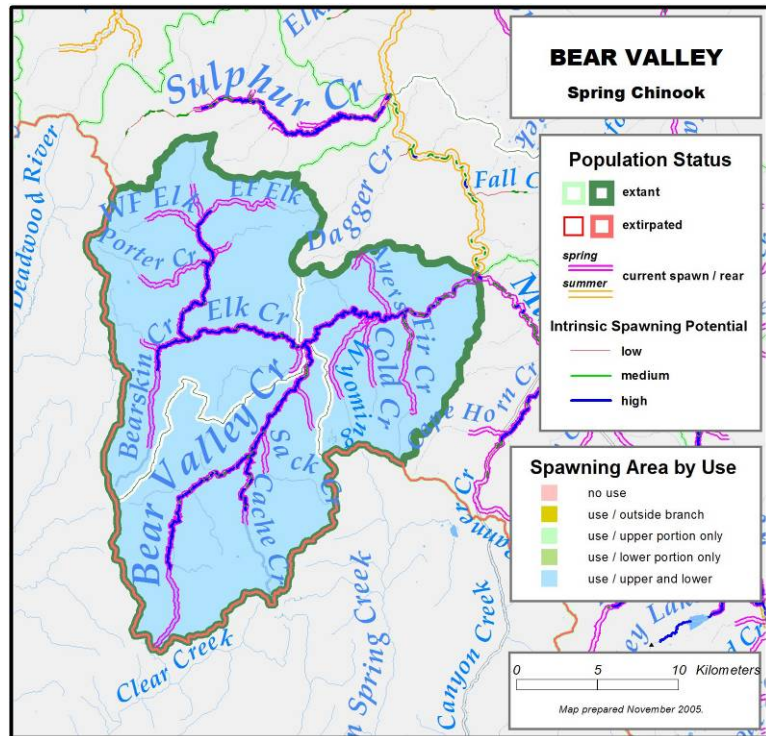
Figure 5. Bear Valley Creek Spring Chinook salmon population current spawning distribution and spawning area occupancy designations.

A.1.c. Increase or decrease in gaps or continuities between spawning areas.

There has been no change in gaps when comparing current and historical spawning distribution. The population is rated at *Very Low* risk because the three historical MaSAs are occupied, gap distance and continuity have not changed, and there has been no increase in distance between this population and other populations in the MPG or ESU.

B.1.a. Major life history strategies.

There are limited data to allow any comparisons between historic and current life history strategies. The IDFG classifies adult spawners as spring run. The known major juvenile life history strategy is a spring yearling migrant. No natural or anthropogenic impacts that could have resulted in loss of a life history strategy are known to have occurred. It appears all historic juvenile and adult life history strategies are present, but because data is limited the metric is rated *Low Risk*.

B.1.b. Phenotypic variation.

There is no data to indicate that any phenotypic traits have been significantly changed or lost. No alterations of within-basin habitat conditions that could have resulted in loss of a phenotypic trait are known to have occurred. No major selective pressures exist which would cause significant changes in or loss of traits. Changes in the mainstem migration corridor (lower Snake and Columbia rivers) likely have altered timing of juvenile downstream passage and adult upstream passage. Because smolt entry into the estuary is substantially delayed relative to historic conditions, this metric is rated at *Low Risk*.

B.1.c. Genetic variation.

Genetic ratings were based on IC-TRT analysis of allozyme data presented in Waples et al. 1993. In addition, the IC-TRT analyzed WDFW and R. Waples, unpublished allozyme data, and P. Moran, unpublished microsatellite data. Samples exhibited high interannual variability and were consistently differentiated from other populations, even from the proximate Marsh Creek population. Also, the samples showed no similarity to any hatchery samples. This metric was rated *Low Risk*.

B.2.a. Spawner composition. 100% Wild fish.

Spawner composition is determined from spawning ground carcass recoveries. Any marked fish that are recovered are examined for the presence of a coded-wire or PIT tag. The entire Middle Fork Salmon River MPG is managed by the IDFG as a wild production area with no hatchery intervention. While carcass surveys have been conducted annually in many of the core spawning areas in the MPG, extremely few hatchery strays have been documented. Assessment of this metric is restricted to the observation of only hatchery strays.

(1) *Out-of-ESU strays*. No out-of-ESU strays have been detected spawning in the population and this metric is rated *Very Low* risk.

(2) *Out-of-MPG strays from within the ESU*. Potential out-of-MPG fish that could stray into this population would originate from hatcheries in the downstream South Fork Salmon River MPG or upstream Upper Salmon River MPG. An exhaustive review of all spawner carcass data has not been completed however, it is possible that one or two hatchery strays were present in the population across all survey years. The occurrence of that small number of strays is not suspected of increasing risk to the population and this metric is rated *Very Low* risk.

(3) *Out of population within MPG strays*. There is no within-MPG hatchery program, and this metric is rated *Very Low Risk*.

(4) *Within-population hatchery spawners.* There is no within population hatchery program, and this metric is rated *Very Low* risk.

The overall risk rating for metric B.2.a "spawner composition" is *Very Low Risk* since the population and entire MPG are managed for wild production and essentially no hatchery strays have been observed spawning in the population.

B.3.a. Distribution of population across habitat types.

The Bear Valley Creek population intrinsic potential distribution historically was one EPA level IV ecoregion (Southern Forested Mountains – 100%). There are no substantial changes in ecoregion occupancy and this metric was rated *Low Risk* for the population.
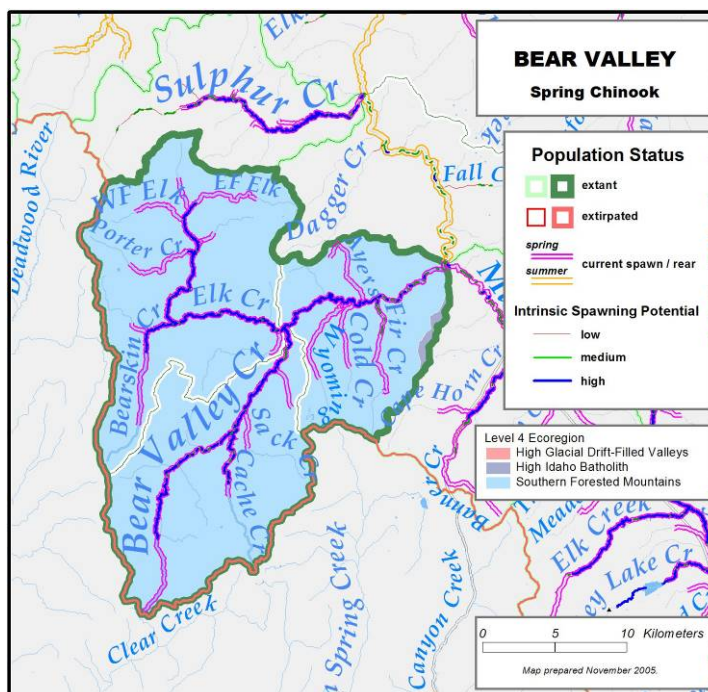
Figure 6. Bear Valley Creek Spring Chinook salmon population spawning distribution across EPA level 4 ecoregions.

Table 3. Bear Valley Creek Spring Chinook salmon population proportion of current spawning areas across EPA level 4 ecoregions.

Ecoregion	% of historical branch spawning area in this ecoregion (non-temperature limited)	% of historical branch spawning area in this ecoregion (temp. limited)	% of currently occupied spawning area in this ecoregion (non-temperature limited)
Southern forested Mountains	100.0	100.0	100.0

B.4.a. Selective change in natural processes or selective impacts.

Hydropower system: The hydrosystem and associated reservoirs impose some selective mortality on smolt outmigrants and adult migrants, the selective mortality is not likely to remove more than 25% of the affected individuals. The likely impacts are rated as *Low Risk* for this action.

Harvest: Recent harvest rates for spring/summer Chinook salmon are generally less than 10% annually. There are no freshwater fisheries directly targeting wild spring/summer Chinook salmon; indirect mortalities are expected to occur in some fisheries selective for hatchery fish. It is not likely that the incidental mortality is selective for a particular group of fish or if it is, it would not select 25% or more of that particular group, therefore this action was rated as *Very Low* risk.

Hatcheries: The proportion of hatchery strays has always been estimated as 0%. This selective impact was rated *Very Low Risk*.

Habitat: Habitat changes resulting from natural events or anthropogenic impacts may impose some selective mortality, but the extent is unknown. Habitat in the basin has been impacted by grazing activities, water diversions on tributary streams and naturally occurring forest fires. It is likely that any selective mortality imposed as a result of habitat alterations in the basin would impact a non-negligible portion of the population. This selective impact was rated *Very Low Risk*.

Spatial Structure and Diversity Summary

Overall spatial structure and diversity has been rated *Low Risk* for the Bear Valley Creek population (Table 4). The *Low* risk rating assigned to this population is driven by mechanism B.1, maintaining natural patterns of phenotypic and genotypic expression, which in turn is influenced by a lack of data. It is very possible the actual risk for mechanism B.1 is Very Low, and the population's overall spatial structure/diversity risk is Very Low.

Table 4. Bear Valley Creek Spring Chinook salmon population spatial structure and diversity risk rating summary.

Metric	Risk Assessment Scores				
	Metric	Factor	Mechanism	Goal	Population
A.1.a	VL (2)	VL (2)	Very Low Risk (Mean=2)	Very Low Risk	
A.1.b	VL (2)	VL (2)			
A.1.c	VL (2)	VL (2)			
B.1.a	L (1)	L (1)	Low Risk	Low risk	**Low Risk**
B.1.b	L (1)	L (1)			
B.1.c	L (1)	L (2)			
B.2.a(1)	VL (2)	Very Low (2)	Very Low (2)		
B.2.a(2)	VL (2)				
B.2.a(3)	VL (2)				
B.2.a(4)	VL (2)				
B.3.a	L (1)	L (1)	L (1)		
B.4.a	L (1)	L (1)	L (1)		

Overall Viability Rating

The Bear Valley Creek Spring Chinook salmon population does not currently meet viability criteria because Abundance/Productivity risk is high (Table 5). The 20-year delimited recruit per spawner point estimate (2.42) is greater than the 1.6 required at the minimum threshold abundance. However, the 10-year geometric mean abundance is only 25% of the minimum threshold abundance. Improvement in abundance/productivity status (reduction of risk level) will need to occur before the population can be considered viable. Also, the population currently does not meet the criteria for a "maintained" population, but has the potential to achieve the Highly Viable status since current spatial structure/diversity risk is Low.

		Spatial Structure/Diversity Risk			
		Very Low	**Low**	**Moderate**	**High**
Abundance/ Productivity Risk	**Very Low** (<1%)	HV	HV	V	M*
	Low (1-5%)	V	V	V	M*
	Moderate (6 – 25%)	M*	M*	M*	
	High (>25%)		Bear Valley Creek		

Figure 7. Bear Valley Creek Spring Chinook salmon population risk ratings integrated across the four viable salmonid population (VSP) metrics. *Viability Key: HV – Highly Viable; V – Viable; M* – Candidate for Maintained; Shaded cells-- not meeting viability criteria (darkest cells are at greatest risk).*

Bear Valley Creek Spring Chinook – Data Summary

Data type: Redd count expansions (Ruzycki, ODFW)
SAR: Averaged Williams/CSS series

Table 5. Bear Valley Creek Spring Chinook salmon population abundance and productivity data used for curve fits and R/S analysis. Bolded values were used in estimating the current productivity (Table 6).

Brood Year	Spawners	%Wild	Natural Run	Nat. Rtns	R/S	SAR Adj. Factor	Adj. Rtns	Adj. R/S
1979	**209**	**1**	**209**	**149**	**0.71**	**0.87**	**130**	**0.62**
1980	**40**	**1**	**40**	**229**	**5.68**	**0.58**	**134**	**3.31**
1981	**151**	**1**	**151**	**257**	**1.70**	**0.63**	**161**	**1.07**
1982	**84**	**1**	**84**	**365**	**4.34**	**0.51**	**187**	**2.22**
1983	**165**	**1**	**165**	**1125**	**6.83**	**0.58**	**648**	**3.93**
1984	**144**	**1**	**144**	**233**	**1.62**	**1.65**	**386**	**2.68**
1985	**295**	**1**	**295**	**133**	**0.45**	**1.57**	**208**	**0.71**
1986	**225**	**1**	**225**	**219**	**0.98**	**1.41**	**310**	**1.38**
1987	**455**	**1**	**455**	**143**	**0.31**	**1.83**	**261**	**0.57**
1988	1114	1	1114	690	0.62	0.75	516	0.46
1989	**91**	**1**	**91**	**121**	**1.33**	**1.79**	**217**	**2.39**
1990	**188**	**1**	**188**	**21**	**0.11**	**4.65**	**98**	**0.52**
1991	**180**	**1**	**180**	**22**	**0.12**	**3.01**	**67**	**0.37**
1992	**177**	**1**	**177**	**141**	**0.80**	**1.65**	**234**	**1.32**
1993	709	1	709	427	0.60	1.61	687	0.97
1994	**32**	**1**	**32**	**65**	**2.07**	**1.04**	**68**	**2.17**
1995	**16**	**1**	**16**	**85**	**5.38**	**0.60**	**35**	**2.20**
1996	**56**	**1**	**56**	**387**	**6.92**	**0.54**	**211**	**3.76**
1997	**225**	**1**	**225**	**1261**	**5.61**	**0.30**	**373**	**1.66**
1998	**376**	**1**	**376**	**1640**	**4.36**	**0.30**	**487**	**1.29**
1999	75	1	75					
2000	313	1	313					
2001	709	1	709					
2002	1120	1	1120					
2003	1264	1	1264					

Table 6. Bear Valley Creek Spring Chinook salmon population geometric mean abundance and productivity estimates (values used for current productivity and abundance are shown in boxes).

	R/S measures				Lambda measures		Abundance
	Not adjusted		SAR adjusted		Not adjusted		Nat. origin
delimited	median	75% threshold	median	75% threshold	1987-1998	1979-1998	geomean
Point Est.	2.87	1.49	2.42	1.47	1.05	1.10	188
Std. Err.	0.25	0.31	0.14	0.18	0.22	0.21	0.48
count	10	18	10	18	12	20	10

Table 7. Bear Valley Creek Spring Chinook salmon population stock-recruitment curve fit parameter estimates. Biologically unrealistic or highly uncertain values are highlighted in grey.

| SR Model	Not adjusted for SAR							Adjusted for SAR						
	a	SE	b	SE	adj. var	auto	AICc	a	SE	b	SE	adj. var	auto	AICc
Rand-Walk	1.33	0.37	n/a	n/a	1.03	0.57	70.1	1.33	0.21	n/a	n/a	0.50	0.16	48.0
Const. Rec	209	54	n/a	n/a	n/a	n/a	67.6	208	36	n/a	n/a	n/a	n/a	51.3
Bev-Holt	4.96	4.56	330	164	0.85	0.55	68.2	3.03	1.04	460	152	0.29	0.21	40.2
Hock-Stk	1.50	0.45	343	232	1.01	0.55	71.6	1.61	0.27	244	81	0.40	0.18	46.7
Ricker	2.03	0.73	0.00170	0.00102	0.95	0.54	70.2	1.96	0.36	0.00156	0.00052	0.34	0.18	43.3
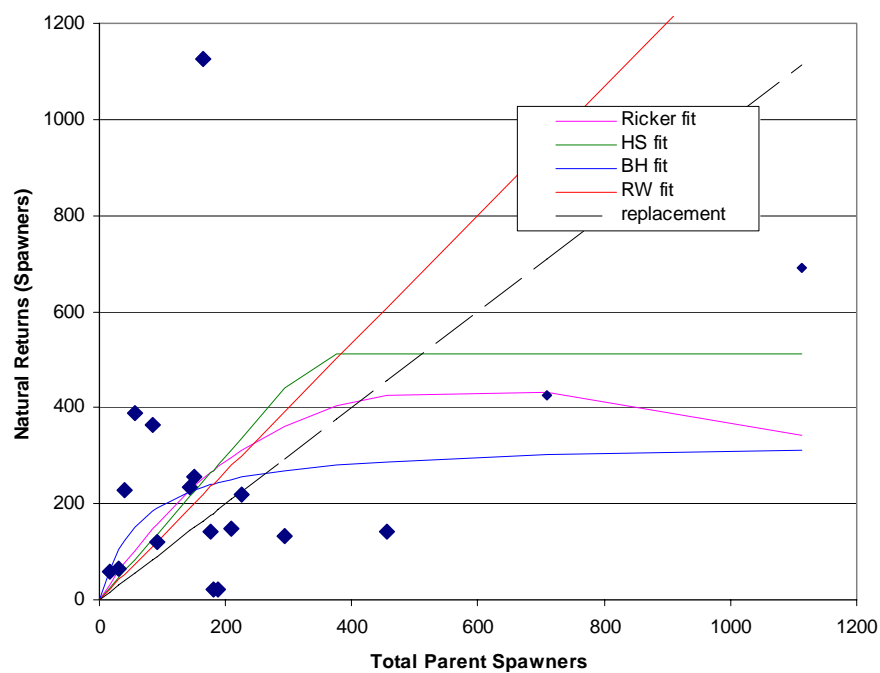
Figure 8. Bear Valley Creek Spring Chinook salmon population stock recruitment curves. Bold points were used in estimating the current productivity. Data were not adjusted for marine survival.
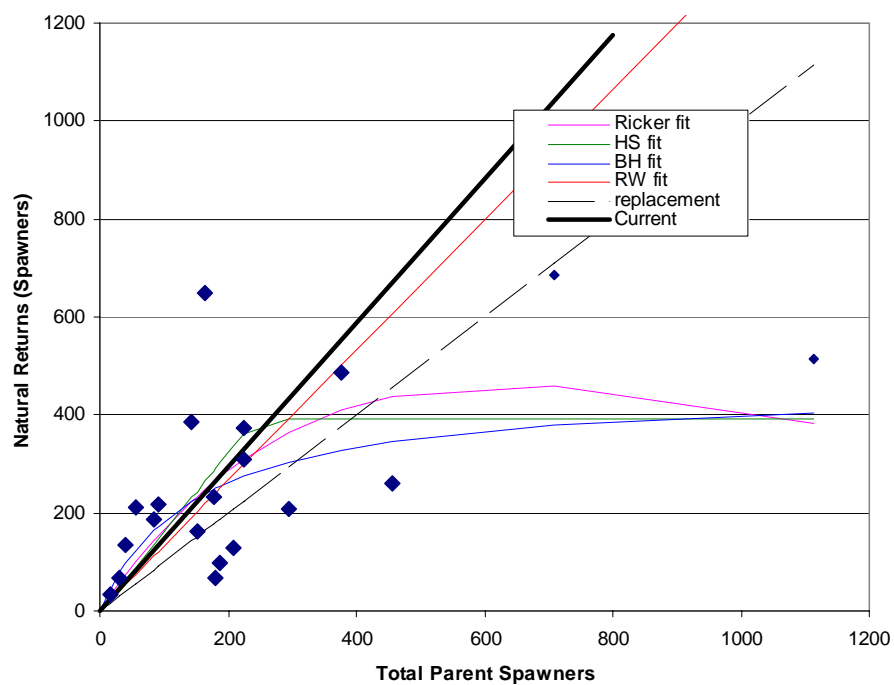

Figure 9. Bear Valley Creek Spring Chinook salmon population stock recruitment curves. Bold points were used in estimating the current productivity. Data were adjusted for marine survival.